MEMORANDUM FOR: SEE DISTRIBUTION May 10, 1996

SUBJECT: MRCI Systems Requirements Review Minutes

1. DMSO conducted the Systems Requirements Review (SRR)for the Modular Reconfigurable C4I Interface (MRCI) effort on 23 Apr 96. The purpose of the SRR was:

a. to insure the PM and the contractor understand the task - clarification of top level requirements with DMSO and the peer review group

b. to insure the PM and the Integrating Contractor possess the necessary information required to design an MRCI that will function not only during the prototype phase, but also an MRCI that is extensible to include other/future C4I systems
- confirmation of NRaD/SAIC understanding of the Services' requirements for the MRCI to enable live C4I systems to interact with the simulation community

2. Discussions. The meeting agenda included:

- Welcome and Introductions
- Tutorials/System Operational Context Setting
  - (CTAPS, MCS/P, AFATDS, FAADC2I, Simulations Overview)
- Communications Links (TADIL A, B, J, Link 16, JTIDS, Autodin)
- OSI Protocol Stack (Relation to RTI/MRCI/C4I System)
- US Army C4I-to-Simulation Requirements
- USAF C4I-to-Simulation Requirements
- Others General Requirements
- MRCI Command and Control Transaction Requirements
- MRCI Information Transaction Requirements
- MRCI Data Transaction Requirements
- MRCI Communications Emulation Requirements
- MRCI Prototype Functional Strings and RTI Interfaces
  - MCS/P & CTAPS

The meeting was co-chaired by Lt. Col. Mark Jefferson, Defense Modeling and Simulation Office (DMSO), Chief Technology Division, and by Mr. Tom Tiernan (NRaD), the MRCI Program Manager, and agent for DMSO.

a. Lt. Col. Jefferson opened the meeting by reviewing the MRCI program and greeting all attendees. Lt. Col. Jefferson said that DMSO will continue to receive and refine requirements for the final product. He announced that the requirements briefed and approved today will drive the design of the 1996 prototypes, but more input was needed for the final product which would include the Navy's and Intelligence community's requirements. Lt. Col. Jefferson said that 4 prototypes were funded for this calendar year, and the ALSP adapter will be a laboratory experiment this year possibly participating in the 1998 Joint Training Confederation. He stated that the 1996 expectations include answering the questions:

(1) how much of the common module portion of MRCI is really common, and

(2) how much commonality is there in the requirements from the various communities.

b. Tom Tiernan briefed the programmatic aspects of MRCI. Tom requested that participants provide written comments on the requirements presented and any other MRCI concerns. He suggested the following meetings:

(1) technical exchange meeting among MRCI and the service technical experts, and

(2) an initial and follow-on future MRCI requirements meeting.

c. Mark Cosby, SAIC/MRCI Integrating Contractor, then briefed the MRCI requirements which had been assembled from the various service/organizational inputs.

3. Tutorials. Mr. Cosby provided several tutorial briefs for the audience that included the following information:

a. Summaries of the primary candidate MRCI experiment systems that are under consideration by the Army and Air Force. Systems include the Advanced Field Artillery Tactical Data System (AFATDS), Contingency Theater Automated Planning System (CTAPS), Forward Area Air Defense Command, Control and Intelligence (FAADC2I), Maneuver Control System (MCS), Air Warfare Simulation/Re-engineered (AWSIM/R) and Corps Battle Simulation (CBS). Mr. Cosby presented descriptions of the systems which included: mission, characteristics, program status, prime contractor, and a graphic or actual picture of the system in operation.

b. Summaries of the primary candidate MRCI experiment communication links. Systems include the Tactical Digital Information Links (TADILs) A, B, C, and J. Mr. Cosby presented descriptions of the systems which included: specifications, Users/Information, formats, representative net, and a graphic picture of the system in operation.

c. A basic overview of the Open Systems Interconnection (OSI) Reference Model. Mr. Cosby presented the seven layer model associated with computer applications software communications. This communications architecture will be used in the design of the MRCI.

4. Requirements. Mr. Cosby introduced this section by explaining that both the Army and Air Force would present their MRCI requirements.

a. Army C4I-to-Simulation Requirements. Mr. Joe Henry, U.S. Army, TRADOC, National Simulation Center, Ft. Leavenworth, KS was responsible for organizing the Army requirements for the MRCI. Mr. Henry made the point that the Army believes the top layer of the MRCI should eventually be a COE interface. Mr. Henry then introduced Lt. Col. Richard Ressler, who briefed the Army requirements. The MRCI is seen as an opportunity for the Army to interface their systems. There is concern about the hardware that will be required to support MRCI because Army field units cannot be overburdened with Sparc workstations in the field. The FAADC2I team in Huntsville wants to discuss the capabilities of their system.

b. Air Force C4I-to-Simulation Requirements. Lt. Col. Charles Snead, U.S. Air Force, XOMT, Washington, DC. presented an overview of Air Force requirements for the MRCI. Lt. Col. Snead works for Col. R. Stanfill, AF/XOM, and asked for answers to the following Air Force concerns: (1) Will MRCI become a DoD mandated requirement, (2) (Who is responsible for) MRCI configuration management maintenance (CONOPS), (3) (Who is responsible for) Legacy model conversion costs, (4) (Who is responsible for) Documentation, (5) (Who is responsible for) Verification, validation and accreditation.

DMSO has the action for answering these questions at the PDR. Mr. Dan Sandini, MITRE, supporting Electronic Systems Center, Hanscom Air Force Base, NH., briefed the Air Force requirements developed at ESC/AVM.

c. Other General C4I-to-Simulation Requirements. In the PM session, Mr. John Zwirner presented STOW requirements. ACOM reported that Army/AF concerns are in sync with those of ACOM. Mr. Cosby then presented the general MRCI technical and operational requirements. He also presented the Defense Information Infrastructure Common Operating Environment (DII COE) Compliance requirements, and the RunTime Environment (RTE) Compliance Levels.

The General MRCI Technical and Operational Requirements were accepted as a baseline set by all participants. The requirements below incorporate all those requirements received during the requirements phase of the MRCI project. Analysis will now occur to determine which requirements can be implemented in the MRCI prototypes during the design phase (note: many of the requirements address C4I to simulation in general and not specifically MRCI). These requirements incorporate the changes suggested during the SRR.

3.3 GENERAL OPERATIONAL AND TECHNICAL REQUIREMENTS

3.3.1 MRCI execution should be transparent to the user and non-intrusive to the C4I system during setup and use.

3.3.2 MRCI shall be able to operate in real time and/or at a speed which results in the perception of real time (perceptible real time) to the C4I system using the MRCI. MRCI must not preclude or inhibit the use of time management schemes supported by the RTI.

3.3.3 MRCI shall operate with dynamic changes in C4I systems task organization and in all mission threads (e.g. planning through BDA and replanning to retasking).

3.3.4 MRCI shall operate during, and recover from, system failures on either its RTI or live C4I side.

3.3.5 MRCI shall support C4I systems representing echelons above Corps to platform level, e.g. infantryman operating autonomously.

3.3.6 MRCI shall not restrict the HLA Federation operations with respect to security level.

3.3.7 MRCI operation shall not be constrained by data, information or C2 formats and shall not introduce additional layers of complexity to the simulation interfaces to the RTI.

3.3.8 MRCI shall be able to go to war and operate across operational warfighting networks.

3.3.9 MRCI shall support bi-directional interactions between C4I systems and the HLA-based Federation.

3.3.10 MRCI shall comply be HLA-compliant.

3.3.11 MRCI must facilitate interoperation with an HLA federation using all five RTI service categories. i.e. Federation Management, Time Management, Object Management, Ownership Management and Declaration Management.

3.3.12 MRCI shall provide the throughput and transport capabilities to facilitate the rapid exchange and synchronization of C4I and Simulation databases (database reconciliation) as executed by the future HLA exercise generation components.

3.3.13 MRCI shall facilitate the collection of both FOM and non-FOM data as defined within the C4I system SOM.

3.3.14 MRCI shall facilitate the establishment of an application-to-application session between the RTI and the C4I system.

3.3.15 MRCI shall provide a mechanism for resynchronization with C4I systems following degraded operations (e.g. tactical picture re-establishment).

3.3.16 MRCI shall be GCCS DII COE compliant (note: initially level 6, eventually level 8).

3.3.17 MRCI shall function with C4I applications written in Ada 95.

3.3.18 MRCI shall support next generation releases of C4I system software (e.g. MCS/P Baseline Build V, Block III; AFATDS V1.0.06).

3.3.19 The MRCI/C4I SOM shall support FOMs produced for STOW demonstrations and exercises which include CBS, OpenSAF, EADSIM participation and entity-level interactions.

3.3.20 To the extent practical, MRCI reconfigurable modules shall be reusable among instances of C4I-MRCI combinations.

3.3.21 MRCI shall support flow of both perceived and ground-truth data, information and C2 transactions consistent with applicable FOM and SOM definitions for Federations in which it participates.

3.3.22 MRCI design shall not be restricted by the use of legacy simulation-to-real world interface solutions.

3.3.23 MRCI design shall not be restricted by the use of alternate redundant mechanisms to the RTI.

3.3.24 MRCI shall be developed using a language for specification of formats, timing and conversion requirements of data, information and C2 interchange in clear, consistent and concise interface specifications of internal and external interfaces.

3.3.25 MRCI shall use well-defined application program interface between layers and the support services.

3.3.26 MRCI shall optimize the interdependencies between software components so that the impact of change is localized.

3.3.27 MRCI shall reduce the number of, and special training required for, system administrators, network administrators, and other exercise support personnel.

3.3.28 MRCI shall minimize life-cycle costs and be logistically supportable.

3.3.29 MRCI shall be flexible, extensible, and modifiable to capitalize on current and emerging industry accepted standards and commercially available products to the maximum extent possible to support the system requirements and to streamline upgrades.

3.3.30 MRCI shall provide sufficient flexibility, modifiability and performance to support changes and extensions to the interfaces on both the C4I and RTI sides.

3.3.31 MRCI shall execute in a distributed manner across heterogeneous platforms including current warfighting systems.

3.3.32 MRCI software shall be portable to different vendor host platforms with minimal or no modifications.

3.3.33 MRCI shall provide an experimental capability to interface AWSIM/R to TBMCS IAW the TBMCS SOM.

3.3.33.1 MRCI shall provide the capability of the current PRW and CWIC interfaces.

3.3.33.2 MRCI shall provide the capability to interface existing simulations with current and rapidly-prototyped C4I systems.

3.3.34 MRCI shall provide an experimental capability to interface NASM/AP to TBMCS.

3.3.34.1 MRCI shall provide the capability to be used with next generation simulations and the Prototype Federation products.

3.3.35 MRCI shall provide an experimental capability to interface AFSAF to TBMCS.

3.3.35.1 MRCI shall support the parsing and transmission of ATO/ACO for virtual mission planning and execution within AFSAF.

3.3.35.2 MRCI shall support operations in Federations where STOW SEID SI and OpenSAF are used IAW the appropriate FOM.

3.3.36 The design of the MRCI shall not preclude the addition of a module to support direct C4I system database access (vice message interchange) when specified in future C4I SOMs.

3.3.37 MRCI must support segregation, labeling and simultaneous existence of live and simulation data within all of its modules and in all of its outputs on both C4I and RTI sides.

3.3.38 MRCI must support the populating of messages with relatively unstructured text content to the C4I system and within the CCSIL-like message converter, while correctly maintaining the intent of such messages.

3.3.39 MRCI must support interpreting messages with relatively unstructured text content from the C4I system and within the CCSIL-like message converter, while correctly maintaining the intent of such messages.

3.3.40 The federation the MRCI participates in must accommodate scaling, normalizing or otherwise harmonizing data and information transactions where "detail mismatches" would result in unrealistic representations of the battlespace to the C4I system.

3.3.41 MRCI must provide functionality compatible with the STOW SSF and data collection facilities in support of STOW FOMs.

3.3.42 MRCI must maintain content integrity and conformity in all internal data-to-data/ information-to-information/ C2-to-C2 transformations.

3.3.43 MRCI must not introduce spatial or temporal inconsistencies into the C4I system's "world view".

3.3.43.1 Via the MRCI, simulated entities must be able to affect the live C4I systems and vice versa. Simulated entities must also be able to control communications between live C4I systems; data, information, and C2 flow between live and simulated world shall be influenced in quantity and quality based on environment, geometric, physics and other connectivity determinants computed elsewhere in the Federation.

d. MRCI Data Transaction Requirements. Mr. Cosby presented the definition of data within the MRCI context. A data element is the minimum content component of any exchange or transaction between HLA participants and, when observed alone, it is always contextually uncorrelated within the temporal and spatial dimensions of the battlespace.

e. MRCI Information Transaction Requirements. Mr. Cosby presented the definition of information within the MRCI context. Any aggregation* of data not intended to change the course of activity of an entity within an HLA Federation. Importantly, aggregations of data which implicitly change the course of activity of an entity due to "priori" defined triggers are command and control transactions.

* by interpretation or any other correlation/combinatorial mechanism

f. MRCI Command and Control Transaction Requirements. Mr. Cosby presented the definition of command and control within the MRCI context. Any aggregation* of data and information explicitly intended to change the course of activity or state of an entity within an HLA Federation. Any aggregation* of data and information known by the originator to implicitly change the course of activity/ or state of an entity within an HLA Federation when received by said entity.

* by interpretation or any other correlation/combinatorial mechanism

Mr. Cosby then gave examples of specific command and control messages extracted from the Army's Task Force XXI FATDS Message Table and the Variable Message Format (VMF) TACFIRE Message cross reference matrix. He then presented requirements of Information Transactions, Data Transactions and Communications Emulations.

5. MRCI Prototype Functional Strings. Mr. Cosby presented the following block diagrams of the candidate systems for this program:

a. Fundamental MRCI Module Connection Topology Drivers. These diagrams indicated the message traffic into and out of each candidate system. The diagram serves as the baseline by graphically displaying each candidate system and the message traffic associated with that system.

b. Fundamental Interaction Thread Drivers (C4I-to-Simulation Bi-directional Data Information, and C2 Flows. These diagrams indicated the message traffic between C4I

systems and the simulations. Hence, these diagrams indicate the next higher level of system to system interaction by portraying the message interaction between the live and simulated systems.

c. Fundamental C4I/MRCI Aggregate Simulation Object Model/Federation Object Model. These diagrams indicated the data, information, and command interactions among federated simulation. Again, these diagrams indicate the highest level of system to system interaction by portraying the message interaction between the live and simulated systems.

d. Bi-directional Functional String (CTAPS-to-AWSIM/R). Mr. Cosby briefed this preliminary data, information, and C2 transformations and flows as a preview of the technical diagrams that will be briefed at PDR. These diagrams indicated the functional flow of data, information, and command interactions within the software that comprise the actual middleware product that sat between the CTAPS and WPC's AWSIM. These diagrams indicate the lowest level of system to system interaction by portraying the message interaction between the live and simulated systems.

e. Discussion.

(1) MRCI and timing. Does it make sense to worry about faster than real time simulations driving real C4I systems? The answer is situation dependent. It may make sense to run a C4I planning system at 2X real time. There is a requirement to distinguish between runtime ratio reqs and latency reqs.

(2) It is important that MRCI be able to log messages on both interfaces. Logging is required for debug/test and may be useful for AAR. Saving state, in addition to logging, is an issue to be investigated.

(3) Plan is for MRCI in 96 to be COE compliant at level 6. Full compliance, level 8, is not achievable due to the level of compliance of the C4I systems attached to MRCI (system specific component).

(4) The philosophical question is: should the MRCI be a message assembler? If this function is bookkeeping then it makes sense for MRCI to do it. If this function is simulation, then the MRCI should not do it? The practical question is: even if assembly is a function that the MRCI should not do, does it need to do it in the short term, this year, to allow MRCI experimentation.

(5) The MRCI does not have a SOM. The C4I system and the MRCI in concert will have a SOM.

(6) CTAPS will migrate to TBMCS. CTAPS communicates with USMTF messages. TBMCS communicates with SQL calls. MRCI will accommodate this migration.

(7) A transition from USMTF to VMF is taking place. This will be a bounded, modular change for MRCI. This is exactly the kind of reason why an MRCI is valuable.

(8) Work to leverage:

(a) TADIL A and B generators written for PRW.
(b) Army SSMs
(c) BLRSI, Army project to leverage.

(9) Where does message translation occur in the MRCI or the simulation?

f. Action Items.

(1) DMSO will provide responses to AF comments addressed in paragraph 4.b. at PDR.

(2) With DMSO/DISA oversight, PM/Contractors develop preliminary design of MRCI.

6. Next events are:

22 May 96
- Follow-up MRCI technical session to at SAIC, McClean, VA
- POC is Mr. Mark Cosby, mark_cosby@cpqm.saic.com

11 Jun 96 - Preliminary Design Review (PDR)
- Ramada Inn ballroom at 4641 Kenmore Ave, Alexandria, VA 22304 (703-751-4510)
- Same location as SRR
- Agenda to follow
- POC is Lt Col Jefferson, 703-998-0660,mjeffers@msis.dmso.mil

16 Jul 96 - Critical Design Review (CDR)
-POC is Lt Col Jefferson, 703-998-0660, mjeffers@msis.dmso.mil

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